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ABSTRACT

An experiment examined whether children of different developmental stages expressed different levels of fear while viewing episodes of the television program, "The Incredible Hulk." Preoperational (3 to 5 years old) and concrete operational (9 to 11 years old) children were shown short videotaped segments taken from the program. Using Jean Piaget's ideas that preoperational children both are unable to comprehend transformations and are "perceptually bound," the study predicted that preoperational children would express more fear at the events depicted in the transformation and posttransformation segments, or whenever the "Hulk" was present in "monstrous" form. In contrast, it hypothesized that concrete operational children would express more fear during the pretransformation segments, when the "human" hero--David--was in danger. Both predictions were confirmed, as was the theory that preoperational subjects would rate the two manifestations of the hero (David and the Hulk) as significantly more distinct than would concrete operational subjects. (Author/FL)

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Developmental Differences in Responses to The Incredible Hulk: Using Piaget's Theory of Cognitive Development to Predict Emotional Effects

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Abstract

An experiment was conducted to determine whether children of different developmental stages differ in their levels of fear expressed during different events in The Incredible Hulk. Preoperational (3-5 years old) and concrete operational (9-11 years old) children were shown a short videotape segment taken from the program. Using Piaget's notion that preoperational children fail to comprehend transformations and the notion that children at this level of development are "perceptually bound" it was predicted that preoperational children would express more fear to the events depicted in the transformation and post-transformation segments, or whenever the Hulk in "monstrous" form was present. In contrast, it was predicted that concrete operational children would express more fear during the pre-transformation segment, when the "human" hero was in danger. These predictions were confirmed. In addition, as predicted, preoperational subjects rated the two outward manifestations of the hero (David vs. the Hulk) as significantly more distinct than did concrete operational subjects. The various cognitive factors that could account for this pattern of results are discussed and implications for theoretical and practical issues in emotional development are suggested.

Developmental Differences in Responses to The Incredible Hulk:
Using Piaget's Theory of Cognitive Development to Predict Emotional Effects

While the concern for the effects of violent television on aggressive behavior is still one that produces a large amount of research activity (e.g., NIMH, 1982), researchers of media effects have begun to investigate other areas that, until recently, received little systematic attention. One such area is the effects of frightening mass media upon children. Although this area of media effects has attracted some research attention over the last 40 years (see Dysinger & Ruckmick, 1933; Eisenberg, 1936; Himmelweit, Oppenheim, & Vince, 1958; Preston, 1941; Wertham, 1953), it has gone neglected in terms of systematic investigation and well developed theoretical frameworks.

Several researchers have recently emphasized the need to investigate the general area of childhood fears (e.g., Graziano, 1975; Ollendick, 1979) and the specific role that the mass media play in inducing such fears (e.g., Cantor & Reilly, 1982; Singer, 1975). Regarding general childhood fears, Ollendick states:

> ...these fears...should not be ignored since even mild to moderate fears cause psychological discomfort and may evolve into more persistent and excessive fear. In addition to the treatment of excessive fears and phobias, our efforts should be focused on the prevention of, or at least constructive response to, these early 'normal' fears (pp. 163-164).

One consistent finding in the literature on children's fears (e.g., Hall, 1897; Jersild, Markey & Jersild, 1933; Mauer, 1965) is the fact that different stimuli frighten children at different ages. A finding such as this one would seem to invite some theoretical explanation, but as Graziano, DeGiovanni, and Garcia (1979) point out, little progress has been made toward understanding the

mechanisms or developmental changes that may explain such a finding. Cantor and Sparks (Note 1) agree with Graziano and his co-workers when they state:

> what is missing from most prior studies is a theoretical structure from which to make sense of observed developmental differences.... The theoretical models of fear that do exist neglect the role of cognitions in the origin, maintenance, and reduction of fears (p. 3).

Several authors have argued that emotional experience and cognition are interrelated in some way (e.g., Birnbaum, 1981; Leventhal, 1980; Mandler, 1975; Sommers, 1981). But none of these authors have dealt primarily with the fear emotion or made any statement concerning the application of their arguments to cognitive development.

Recently, however, Cantor (Note 2) reported on a series of studies on the general topic of children's fright induced by mass media. In using Piaget's stage theory of cognitive development as a starting point for these studies, Cantor argues:

> An emotional reaction to a mass media stimulus should be highly dependent on the child's perception, comprehension, and interpretation of that stimulus. If different developmental stages imply differences in cognitive abilities that affect these processes, then there is good reason to expect different emotional reactions at different stages (p. 4).

This approach, like Piaget's (see Décarie, 1978; Flavell, 1963; Piaget, 1953-54), recognizes a link between cognition and emotion. It also shows potential to provide the theoretical structure that has been missing in the literature on children's fears. In addition, the kind of theoretical structure implicit in the approach is consistent with the present move in mass media research toward theories which emphasize the viewer as an active

participant rather than a passive recipient of media content (see Cantor, Note 2; Collins, 1982; Sparks, Note 3; Sparks & Wilson, Note 4). This move has also been accompanied by the application of cognitive developmental theories to the general area of television and children (e.g., Acker & Tiemens, 1981; Wackman & Wartella, 1977).

In using Piaget's theory, Cantor has focused upon several of the key distinctions that Piaget makes between preoperational and concrete operational thought. Cantor and Sparks (Note 1) were able to predict the types of programs that parents of preoperational (age 3 and 4) and concrete operational children (age 9 and 10) would mention as having frightened their children. Using the assumption that preoperational children fail to adequately distinguish fantasy and reality (see Piaget, 1924), they predicted that the preoperational child should be frightened by programs containing fantastic or impossible events and characters. On the other hand, older children, who have reached the stage of concrete operations were expected to be less frightened by impossible events and more frightened by fictional and real presentations (depicting things that could occur). These expectations were borne out.

Wilson and Cantor (Note 5) used Piaget's notion of "egocentric thought" (Piaget & Inhelder, 1956) and more recent theorizing on the topic (e.g., Chandler & Greenspan, 1972). They successfully predicted that preoperational children, while being able to identify the emotion of fear, would be unable to take the perspective of a character expressing fear and consequently would not empathetically experience fear. This was in contrast to concrete operational children, who could take the perspective of another and consequently felt fear when the character expressed fear.

This paper deals with the application of more of Piaget's distinctions between preoperational and concrete operational thought--the notion that preoperational children are "perceptually bound" and the related notion that

they fail to comprehend transformations (Flavell, 1963; Inhelder & Piaget, 1958). Flavell describes these tendencies as follows:

> the preoperational child is confined to the surface of the phenomena he tries to think about, assimilating only those superficial features which clamor loudest for his attention.... The child is much more inclined to focus attention upon the successive states or configurations of a display than upon the transformations by which one state is changed into another.... And when the child does turn his attention to transformations, he has great difficulty; he usually ends up assimilating them to his own action schemas rather than inserting them into a coherent system of objective causes (pp. 157-158).

From any sampling of the genre of frightening mass media, it becomes obvious that the "transformation" of a character from one physical state to another is a frequent happening, and it appears that such happenings contribute to the excitement and fright experienced by the viewer. Examples of transformations are found in recent popular movies such as The Exorcist, Superman, An American Werewolf in London, Dracula, The Howling, Cat People, and Wolfen. Although most of these movies were not initially designed for children, the fact that they sooner or later are shown on broadcast television or via cable makes it very likely that children actually do see many of these presentations. The question to be asked here is whether the Piagetian concepts of perceptual-boundedness and failure to understand transformations can be used to predict and explain developmental differences in children's fear responses to transformations.

The present study deals with a specific transformation that occurs in a recent highly popular television series--The Incredible Hulk. In this series, the hero, David Banner, has been altered through an accident involving radiation.

Under most conditions, he looks and acts like a normal person, but when he is angered, he is transformed into a scary-looking, green-faced, muscle-bound "Hulk." During the transformation, the hero's body, and particularly his muscles, are shown to expand to the point where they rip his clothes apart. The transformation ends as the Hulk tears off a few remaining pieces of ripped clothing, flexes his muscles, and growls menacingly. The two forms of the character are played by different actors, but the sequence is cut to imply that the hero becomes the Hulk through an uncontrollable metamorphosis. Each episode shows the hero in a different threatening situation, which he is unable to cope with. Then, some aspect of the threat sets off the transformation. The metamorphosis endows the character with superhuman strength, which he readily uses to combat the threat and diminish the danger. In whatever form he occurs, the hero/Hulk is benevolently motiviated, defending the good and the weak against powerful villains of all kinds. Although he uses his strength aggressively, it is always for a "good" cause.

While not specifically a children's program, The Incredible Hulk has enormous popularity with youngsters. And although it is not generally considered an especially frightening show, it does seem to cause a good deal of concern among the parents and teachers of preschool children. In the survey of parents mentioned earlier (Note 1), forty percent of the parents of three- and four-year-olds spontaneously mentioned The Incredible Hulk as a cause of enduring fright in their children. This percentage was substantially higher than that for any other program or movie.

In attempting to explain this unexpected finding, it seems reasonable to look at the transformation as a primary source of fright. Given what is known about preoperational children's lack of comprehension of other types of transformations, the question may be raised as to the extent to which young children

understand such transformations and whether any such lack of understanding can be used to predict fear responses.

The major source of information on preoperational children's dependence on perceptual cues and their failure to comprehend transformations comes from the "conservation" experiments conducted by Piaget and others. The conservation task that seems most relevant to an appreciation of mass media transformations has been referred to as "identity conservation" by Elkind (1967). A child is considered to conserve identity when he or she recognizes that if, for example, water is poured from one beaker (A) into another beaker of different dimensions (A'), the quantity of water remains the same.

Piaget has shown that preoperational children (under the age of seven years) have difficulty solving conservation problems. A major focus of research in recent years has been the determination of why the preoperational child fails to conserve and how he or she becomes a conserver.

Piaget's explanation of the process of conservation has received various interpretations (cf. Elkind, 1967; Acredolo, 1981), but it essentially revolves around the notion of "compensation." As Elkind states:

> The basic mechanism which Piaget postulates to account for how the child comes to deal with this problem is what Piaget has called the "equation of differences" or "compensation." In brief, Piaget holds that the child gradually comes to see that for any given object a change in one dimension is exactly compensated by an equal and inverse change in a second dimension. This discovery ... underlies the child's insight that transformations are reversible and that they leave the object (property or quantity) invariant (pp. 18-19).

This interpretation, which stresses the ability to recognize and appreciate visual cues regarding volume, seems to have little relevance for an understanding

of what happens in The Incredible Hulk. However, many researchers, beginning with Bruner (1966) have argued that Piaget's explanation is not adequate to account for the acquisition of conservation (e.g., Acredolo & Acredolo, 1979, 1980; Anderson & Cuneo, 1978; Gelman, 1969; Gelman & Weinberg, 1972; Hamel, 1971; Larsen & Flavell, 1970; Schultz & Dover, 1979). Some argue (e.g., Green & Laxon, 1970) that most adults never achieve the ability to recognize when one dimension of a three-dimensional object is exactly compensated for by a change in another dimension. Bruner (1966) and others have shown that if certain misleading perceptual cues are removed from the situation, many children formerly labeled as nonconservers become able to solve the conservation problem correctly. Obviously, they have not learned to identify the appropriate compensating dimensions; they have simply been shielded from confusing visual cues.

Green and Laxon (1970) have defined "true conservation" as the knowledge that an amount is the same provided nothing is either added or taken away. According to this view, a child becomes a true conserver when he or she learns to discount discrepant visual cues in the conservation task. These researchers, then, take the view that the child says that the water in the two beakers is equal because it's the same water--no matter how it looks.

This notion, that an underlying identity does not change, does seem relevant to transformations such as the one occurring in The Incredible Hulk. A child who understands what is happening in this program knows that David Banner and the Hulk are two outward manifestations of the same character. These two beings may have different looks and different abilities, but they are the same person, with the same goals, intentions, and motivations.

It might be expected, then, that preoperational children would be frightened by the Hulk because they center attention on his grotesque exterior and because, focusing on the static end states rather than comprehending the transformation, they do not see the essential link between the hero and the monster.

Older children should be less frightened by the Hulk because they should be less readily overwhelmed by the salient perceptual cues and because, being "conservers," they come to appreciate the process of transformation that the character goes through.

Two further issues complicate this analysis as it applies to responses to the mass media. First, transformations of the type occurring in The Incredible Hulk are unreal. They do not and cannot occur in the real world. Preoperational children, who are less competent in distinguishing play and reality (Piaget, 1924; Flavell, 1963), should therefore feel more threatened by such transformations than older children should be.

The second complication in applying the acquisition of conservation to the transformations in the mass media lies in the fact that although real-life transformations of the outward appearance of a person usually leave the inner personality of the person unchanged, mass media transformations sometimes result in character changes as well as visual changes. Although the Hulk retains the good intentions of David Banner when he emerges, when Dr. Jekyll becomes Mr. Hyde, an ordinary person becomes an evil menace. Thus, the underlying "meaning" of a transformation in the mass media must be learned for each story or program or series. The knowledge that the Hulk is well motivated must be learned through exposure to the program. In order to really understand The Incredible Hulk, then, a child must learn, through experience with the program itself, not only that the hero and the Hulk are the same person, but that the transformation is in outward appearance and manner only—the inner motivations of the hero remain.

It may be expected, then, that younger children will be more frightened by the Hulk than will older children because of less exposure to the program and fewer opportunities to learn the underlying assumptions of the story. But over and above differences in experience, preoperational children should have a more difficult time assimilating the knowledge that the Hulk is well motivated,

because it should be more difficult for them to comprehend the transformation and to discount the salient visual cues of grotesqueness and monstrosity.

The differences postulated above between preoperational and concrete operational thought lead to the following predictions regarding responses of children from these two age groups to the same episode of The Incredible Hulk:

H1: Relative to the level of fear during a pretransformation segment of The Incredible Hulk which depicts David Banner in some danger, preoperational children should show a significantly higher level of fear both during and after the transformation from David Banner to the Hulk.

H2: Relative to the level of fear during a pretransformation segment of The Incredible Hulk which depicts David Banner in danger, concrete operational children should show a significantly lower level of fear both during and after the transformation from David Banner to the Hulk.

The first hypothesis follows directly from the fact that preoperational children are perception-bound and will not be able to take account of and reflect upon the fact that the Hulk's values, goals, and motives are the same as David Banner's. The second hypothesis follows partially from the fact that concrete operational children should be able to reflect upon this information and decenter their attention from the ugly visual cues. In addition, these children should be more likely to recognize and reflect upon the danger present in the pretransformation segment. For these children, the transformation should represent the means toward a solution to that danger rather than an event to be feared.

In addition, the following hypotheses are also advanced:

H3: Preoperational children will tend to perceive David Banner as significantly more good, more nice, and more inclined to be helpful than the Hulk.

H4: Concrete operational children will tend to perceive David Banner and the Hulk as more similar on the above mentioned dimensions than the preoperational children perceive them.

These hypotheses follow directly from the conservation analysis. If preoperational children fail to conserve "character identity," they should base their judgments of the character upon the visual information presented to them. Concrete operational children, in contrast, should be more able to reflect upon the fact that the visual information contained in the transformation and in the Hulk has not altered these basic characteristics of David Banner.

Even though experience with the program is considered necessary for an understanding that David Banner and the Hulk have the same motivations, the differences between the responses of preoperational and concrete operational children are expected to be observed even after the amount of prior exposure to the program is controlled for. This should reveal that preoperational children have difficulty assimilating information that seems to conflict with their overriding visual perceptions.

It must be acknowledged here that since preoperational and concrete operational children differ in innumerable ways, confirmation of the hypotheses advanced will not necessarily implicate the aspects of preoperational and concrete operational thought that have been singled out in making the predictions. In order to examine some of these aspects more closely and to determine their relationships to the observed effects, two other measures were included: To assess more directly subjects' level of comprehension of the transformation sequence, subjects were later asked to explain what was happening during that portion of the program. In addition, subjects were given a standard liquid conservation task, so that their ability to respond competently in that realm could be related to their emotional responses to the different parts of the program.

Method

Subjects

Subjects were 50 children enrolled in two preschools and 51 children enrolled in an elementary school during the spring and summer of 1982 in Madison, Wisconsin. The distribution of age and sex for preschool children was as follows: (3-year-olds: 1 male, 1 female; 4-year-olds: 11 males, 10 females; 5-year-olds: 16 males, 11 females). The elementary school children were distributed as follows: 9-year-olds: 6 males, 6 females; 10-year-olds: 13 males, 8 females; 11-year-olds: 13 males, 5 females. Each child volunteered to participate and secured parental permission before participating.

In order to maximize the similarity of the preschool and elementary school children on socio-economic variables, the elementary school and one of the preschools were selected because they were located directly across the street from each other. Thirty-four subjects were recruited from this preschool. In order to achieve approximately equal sample sizes for the two age groups, 17 subjects were recruited from a second preschool. The responses of subjects from the two preschools did not differ.

Design

Developmental level (preoperational, concrete operational), operationalized in the subject's age, was the major independent variable. To reduce the probability of sampling subjects in transition between the stages, the mid-ranges of these stages as delineated by Piaget were chosen. Thus 3- to 5-year-olds represented the preoperational stage; 9- to 11-year-olds represented the stage of concrete operations. Self-reported reactions to three major parts of a segment of The Incredible Hulk (pre-transformation, transformation, post-transformation) were analyzed in 2 X 3 designs. Ratings of the two manifestations of the main character (David, the Hulk) were analyzed in 2 X 2 designs. In addition,

analyses of covariance were performed, using subjects' previous exposure to The Incredible Hulk as a covariate. These analyses were repeated using sex of subject as a factor, but no sex differences emerged. Similar analyses were also performed on subjects' explanations of the transformation scene and on their performance on a liquid conservation task.

Procedures

Prior to the experiment, children were given a letter to take home to their parents. The letter gave a broad overview of the research and a brief description of the experimental procedure and the specific film clips and dependent measures to be used in the study. The letter also invited the parents to an orientation session, which allowed them to preview the film-clips and observe the experimental equipment. Finally, the parents were asked to sign the bottom of the letter and return it to the child's teacher if they wanted their child to participate in the experiment.

Arrangements at the preschools and the elementary school differed slightly. Parents of participating preschoolers were contacted by phone to arrange a time for the child to participate. These times were scheduled outside of the child's preschool class time in order not to disrupt the preschool program. During the phone conversation with the parent, a series of short questions was asked to gather information about the child and the child's TV viewing habits. Since elementary school children could be tested during the regular school day, no special appointment was necessary. Parents of these children were phoned after the experiment and asked the questions about their child's TV viewing habits.

Several days before the experiment began, each child came to a 30-minute group orientation session presented to each of the targeted classes in all of the participating schools. This session was held in the same room as the actual experiment. During this session, the children met the experimenters,

who gave a demonstration of the equipment being used in the experiment and described the experimental procedures in general terms. At the end of the demonstration, the children were told that those who wished to participate could do so if their parents returned the signed permission letter.

Subjects were tested individually. Upon arriving for the experiment, the subject was taken into the experimental room and seated in a chair which was 3.6 meters from a TV monitor. The experimenter made certain at this point that the subject was comfortable and positively disposed toward the session. After the subject indicated that he or she was ready to begin, the experimenter started the videotape of short film clips and sat down in a chair that was 1 meter from the subject's chair. Each subject's hand was attached to three finger sensors monitoring various physiological responses during the videotape. The subjects had become acquainted with these measures and the procedures for attaching the sensors during the orientation session. Because this paper focuses only on the self-report measures, a full description of these sensors and the procedures and equipment associated with them are omitted here. In a future paper, these other measurements will be reported.

The videotape ran non-stop for 15 min. 30 sec. Pauses between the film clips were built into the tape. During these pauses, the experimenter asked the subject a series of questions about the episode just seen or about his or her reactions to that episode. After the videotape was over, the experimenter walked the child to an adjoining room where he or she was seated at another table. Here, the experimenter asked some additional questions about some of the characters seen in the videotape. Finally, the experimenter administered a standard liquid conservation task. After this task, the experimenter asked the elementary school subjects the same questions that were addressed to the parents regarding the child's television-viewing habits. As a reward, the preschool children were allowed to select a "scratch-'n'-sniff"

sticker before being escorted back to their waiting parent. The experimenter made certain that each child left the experiment in a positive mood.

Equipment and Materials

The videotaped segments were played on a 3/4" Sony videocassette player and shown on a 19" Sony color monitor-receiver.

The videotape consisted of a series of six short segments edited onto one tape with pauses in between them. Most of these segments were chosen to be calming and nonarousing, so that subjects could relax and become comfortable in the setting. The first, second, fourth, and sixth segments were excerpts from educational programming seen on PBS. They featured, in this order, farming (51 seconds), nature scenes (96 sec.), people in service professions (83 sec.), and baby animals (62 sec.). The fifth segment was a clip from the Wizard of Oz (187 sec.), which served as the stimulus for another study.

The scene from The Incredible Hulk (191 sec.) was the third segment to be seen. It began 215 seconds after the start of the videotape. In this scene, a hospital worker is trapped in an explosion. David Banner attempts to rescue the worker, but is not strong enough. An explosion hurls him against a wall, and he is transformed into the Hulk, who then carries the worker to safety. The Hulk gently lays the injured man on the floor after saving him. Many of the bystanders are frightened by the Hulk's appearance. He runs through the hospital corridor, leaps through a plate glass window, and growls before running away. This segment was used exactly the way it appeared on the air with the exception of two, 3-second segments of transformation footage from another episode that were spliced into the transformation segment. This was done in order to heighten the detail of the transformation so that even children who had never seen an episode of the program would be able to perceive the transformation events with no difficulty. Adults who viewed the final

sequence could not detect that any extra editing had taken place. This segment was followed by 110 seconds of black screen to allow the experimenter to ask the subject about reactions to what had just been seen before the fourth segment appeared.

Three glass containers were used for the liquid conservation task. Two identical jars were used that were 85 mm high, with a diameter of 35 mm at the top and 50 mm at the bottom. In addition, a standard 50 ml Pyrex cylinder with a constant diameter of 25 mm and a height of 175 mm was used. Orange koolade was used as the liquid in these containers.

Dependent Measures

Responses to all questions were written down by the experimenter immediately after the child made the response. After the Incredible Hulk segment ended, the experimenter asked, "How did you feel while you were watching the last program?" This response was written down. Then, if the child did not mention feeling scared or frightened, the experimenter asked directly, "Did you feel scared?" A negative response here prompted the experimenter to move on to the next question. If, however, the child's answer to either of these questions indicated fright, the child was shown a 65 cm X 20 cm piece of laminated cardboard. On the cardboard were three ink drawings of a child's face expressing fright. Moving from left to right on the cardboard, the intensity of the fright expressed on the face increased. The changes in expression were accomplished mainly by changing the size of the mouth opening, the size of the eyes, and the curve on the eyebrows. The faces were labeled from left to right respectively, "a little bit scared," "very scared," and "very very scared." The size of the letters in the word "scared" increased from 2.5 mm for the first face to 10 mm for the middle face to 32.5 mm for the most frightened face. The size of the letters of the modifiers preceding the word "scared" also increased proportionally. Upon showing the child these faces, the experimenter said, "Could you point to

the face that shows how scared you felt?" and read through the words under each picture. No predictions were made regarding responses to these questions, which referred to the entire show. They were included to familiarize the child with the procedures to be used for the rest of the questions.

The next three sets of questions followed the same format and concerned the events during the three major parts of the Incredible Hulk segment: 1) the events before the transformation from David to the Hulk (pre-transformation), 2) the transformation itself, and 3) the events after the transformation (post-transformation). For each of these 3 parts, the experimenter started by showing the child four, 9 X 12 cm color photographs (six photos for the transformation scene) taken from that part of the segment. The photos were arranged from top to bottom in the order of their occurrence and laminated on a piece of cardboard. For each of the three photo sequences, the experimenter asked, "How did you feel during this part of the program when these were the pictures you were seeing on TV?" Again, if the child did not mention feeling scared or frightened, the experimenter asked directly, "Did you feel scared?" As before, a negative response to this question prompted the experimenter to move on to the next question. If the child's answer to either of these questions indicated fright, the previously described facial drawings were shown to the child accompanied by the question, "Could you point to the face that shows how scared you felt?" This set of questions was asked for each of the three parts of the program in the order in which the parts occurred.

After the videotape was over and the child was seated in the adjoining room, the experimenter told the child that there were a few more questions about some of the people that had just been seen on TV. At this point, the experimenter showed the child a 9 X 12 cm snapshot of either David Banner or the Hulk and asked the child to indicate whether the picture showed someone

who was "bad or good," "nice or mean," and whether the person liked to "hurt people or help people." Depending on the child's choice on each of these three judgments, the experimenter then showed the child a 45 cm X 10 cm piece of laminated cardboard with the choices written in 3 different sized letters (2.5 mm, 10 mm, and 32.5 mm) and accompanied by the adjectives, "a little bit," "very," and "very very," respectively. In the case of the "hurt people or help people" choice, the modifiers were "a little bit," "very much," and "very very much." The experimenter asked for these judgments for both the Hulk and David Banner. The order of presentation of the two characters was randomized. For each subject, the three pairs of descriptors always appeared in the same order for evaluating the two characters, but half of the subjects at random heard the positive adjective first on the first and third adjective pairs; the other half heard the positive adjective first on the second pair only.

Following these questions, the subject was again shown the sequence of six photos from the transformation part of the segment and was asked, "Could you tell me what was happening on the TV show when you saw these pictures?"

Finally, the child's attention was directed to two small jars, each containing 30 ml of orange koolade. The experimenter asked the child if the two jars would give the same amount or different amounts of koolade to drink. After the child stated that the two jars would give the same amount of koolade to drink, the experimenter put one of the jars aside and out of the subject's view, took the remaining jar, and poured the koolade into a tall, thin 50 ml cylinder while saying,

> Now watch, I'm going to pour this koolade over here into this glass. Is there the same amount of koolade to drink in this glass as there was when it was over here, or is there a different amount of koolade now?

After the child responded, the experimenter asked how the child knew this. These responses constituted the measure of identity conservation (Elkind, 1967).[1]

The last self-report measures were the questions posed to the parents of all the subjects. Parents were asked whether or not their child had ever seen The Incredible Hulk and, if so, about how many times. Response categories were, "never seen," "one time," "2-6 times," "7-10 times," and "more than 10 times." In addition, parents were asked to estimate about how many hours per day their child watched television on an average day. Response categories were "0-1 hour," "1-2 hours," "2-3 hours," "3-4 hours," and "more than 4 hours." These questions were also answered by the elementary school children regarding themselves.

Results and Discussion

The first results to be reported are for the question that was asked regarding the pre-transformation, transformation and post-transformation events in The Incredible Hulk: "How did you feel during this part of the program when these were the pictures you were seeing on TV?" Responses to this question were coded for the tone of feeling (positive, neutral, or negative) mentioned by the child and for whether or not the response indicated a feeling of fear. Two coders who were blind to the developmental level of the child independently coded these responses. Coding reliability for these items was .98.[2]

Three 2 X 3 frequency tables, one for each segment of The Incredible Hulk, were constructed. Each table compared the two developmental levels on the tone of the feeling reported by the child. These results are reported in Table 1. As the table shows, the frequency table for each of the three segments produced

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Table 1 about here

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a highly significant chi-square statistic. Further, the percentage of preoperational children reporting negative feelings increased from the pre-transformation segment to the transformation segment, and dropped slightly for the post-transformation segment (27%, 47%, and 40% respectively). The percentage of concrete

operational children reporting negative feelings showed a decrease as the program moved through the pre-transformation/transformation/post-transformation events (33%, 26%, and 18% respectively). Similarly, positive feelings decreased from pre-transformation to transformation in preoperational children and increased in concrete operational children from one section to the next.

As noted earlier, responses to this open-ended question were also coded for whether or not they expressed fear. A similar analysis on these data revealed no significant differences. However, differences did emerge on the direct question, "Did you feel scared?" Table 2 shows these results. The frequency of "yes" and

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Table 2 about here

"no" responses for the two developmental levels differed by the chi-square test for both the pre-transformation ($p < .06$) and post-transformation segments. A greater proportion (approaching significance) of concrete operational (55%) than preoperational (34%) children expressed fear during the pre-transformation segment, and a greater proportion of pre-operational (46%) than concrete operational (22%) children expressed fear during the post-transformation segment. In addition, the percentage of preoperational children reporting fright increased as the program moved through the pre-transformation/transformation/post-transformation sections (34%, 40%, and 46% respectively). The percentage of concrete operational children reporting fright decreased through these same segments (55%, 24%, and 22% respectively).

Responses to the question, "How scared did you feel?" were also analyzed for each of the three segments of the program. These responses were coded in the following way: "not at all scared" = 0; "a little bit scared" = 1; "very scared" = 2; "very very scared" = 3. A 2 X 3 mixed-design analysis of variance with unweighted means for unequal cell frequencies was performed on these responses. The two levels of development constituted the between-subjects factor and the three segments of The Incredible Hulk constituted the repeated-measures factor.

The results of this analysis showed a significant interaction between developmental level and the trial factor [F (2,194) = 9.94, p = .0001]. Subsequent comparisons of means showed that the degree of reported fear for preoperational children increased from the pre-transformation segment to the post-transformation segment (pre-transformation = $.56_a$, transformation = $.70_{ab}$, post-transformation = $.94_b$). The degree of reported fear for the concrete operational children decreased from the pre-transformation to the transformation, and remained low (pre-transformation = $.73_b$, transformation = $.29_a$, post-transformation = $.30_a$). [In these mean comparisons, different subscripts indicate mean differences at $p < .05$ by the Scheffé procedure.]

These results were virtually duplicated when an analysis of covariance was done using as the covariate the parent's reports of the number of times the child had seen The Incredible Hulk. This was performed in order to verify the hypothesis that the predicted effects would hold over over and above the impact of the child's experience with the program.

Children also responded to questions on the degree to which David Banner and the Hulk were either "good or bad," "nice or mean," and how much they liked to "help or hurt." For each of the adjective pairs, the positive adjective was coded in the following way depending upon the child's response: "a little bit" = 5, "very" = 6, "very very" = 7. Likewise the negative adjectives were coded in the following way: "a little bit" = 3, "very" = 2, "very very" = 1. The resulting scale from 1 to 7 for each adjective pair reflected a range from very negative to very positive. A 2 X 2 mixed-design analysis of variance for unequal cell sizes (unweighted means) was performed for each of the descriptor pairs. In each analysis, developmental level of the subject constituted the between-subjects factor and the character (David, the Hulk) constituted the repeated-measures factor.

Table 3 shows the results of these analyses, reflecting a significant interaction between developmental level and the trial factor for all three adjective pairs. Inspection of the means associated with these effects reveals that, as

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Table 3 about here

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predicted, the difference between the ratings of David and the Hulk is always larger for the preoperational children than for the concrete operational children. For the ratings of "good-bad" and "help-hurt," concrete operational children rated David and the Hulk similarly, whereas preoperational children gave the Hulk significantly lower ratings than David. The Hulk was given lower ratings than David on the "nice-mean" scale by both age groups. However, the Hulk was rated lower by the preoperational than by the concrete operational subjects. Looked at from another perspective, preoperational and concrete operational subjects did not differ in their ratings of David. However, the Hulk received significantly lower ratings by preoperational than by concrete operational subjects on all measures. Again, all of these results were completely unaffected when the measure of the child's previous exposure to The Incredible Hulk was used as a covariate in the analysis.

These analyses provide strong support for the hypotheses outlined earlier. Using age as the operationalization of level of cognitive development, preoperational children were more likely to express fear both during the transformation from David to the Hulk and after the transformation when the Hulk was the focus of the action. Concrete operational children were more likely to express fear before the transformation events and were significantly less afraid during and after the transformation. In addition, the rated difference between David and the Hulk on three different character dimensions was significantly greater for preoperational children than for concrete operational children. Further, all of these results remained even after controlling for the amount of experience that the child had had with the program The Incredible Hulk.

While these results appear to be consistent with the theoretical analysis, caution must be exercised before attributing these effects to the specific cognitive factors outlined earlier (e.g., perceptual boundedness and failure to understand transformations). The problem with using age as the blocking variable in these analyses is one with which developmental psychologists continually struggle. There are, of course, literally thousands of changes that occur as a child matures. In principle, there could be any number of factors which covary with age that could account for observed differences between age groups. There are two strategies which may be employed to deal with this problem. First, the researcher can attempt to control for the potential effects of competing explanations as was done in this study in controlling for the child's experience with The Incredible Hulk. Second, specific evidence may be sought which strengthens the link between the proposed theoretical explanation and the observed results. In an effort to gather such evidence for the results reported here, two additional analyses were undertaken.

Data from the question which asked the child to explain what was happening in the transformation photos was used in an attempt to show the relationship between failure to understand transformations and fright during the three segments of The Incredible Hulk. Responses to this question were coded into three categories: 1) visual cues only--the explanation of the transformation made exclusive reference to visual cues (e.g., "his shirt is ripping" or "his skin is green"), 2) visual cues and transformation--the explanation made reference to visual cues but also made reference, after further probing by the experimenter, to the fact that David was turning into the Hulk, and 3) transformation only--the explanation made spontaneous reference to the fact that David Banner was turning into the Hulk. Coding reliability for this question was .95. Results of the analysis relating the responses to this question with age are shown in Table 4. As can be seen, the large majority (73%) of concrete operational children explained the photos by making spontaneous reference to the transformation. In contrast, almost

half of the preoperational children had no response or made exclusive reference to visual cues. Presumably, children giving responses in these two categories

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Table 4 about here

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failed to comprehend the process of transformation. However, analyses of the fear responses using responses to this question as blocking criteria showed that these two variables were generally not significantly related. Analyses of variance on the ratings of degree of fear were conducted by blocking subjects into groups based on their explanations (visual only vs. both cues and transformation vs. transformation only; also transformation only vs. all other explanations). However, none of these analyses yielded significant effects. Thus, although the type of description given was highly related to the subject's age, these descriptions had little relationship to reported fear. One problem with this measure is that it depends heavily on the verbal ability of the child, and this ability may develop independently of the level of comprehension the description is supposed to reflect.

Since the ability to perform identity-conservation tasks is thought to be related to the ability to decenter from perceptual cues and to the comprehension of transformations, a second reanalysis was conducted using performance on the liquid conservation task as a blocking variable. Children were considered to conserve identity: 1) if they stated correctly that the two containers would give the same amount to drink, and 2) if they could give an adequate reason that was relevant to the correct response. Relevant reasons typically fell into one of three categories: a) compensation--e.g., stating that one jar was wider than the other, b) disregarding perceptual cues--e.g., stating that it was the same amount of water no matter the shape of the container, and c) identity--stating that nothing had been added or taken away. Reasons such as, "because the water is orange" were judged to be irrelevant and thus inadequate reasons. Coding reliability for the identity conservation reasons was .94.

The composition of the two groups formed on the basis of the child's performance on the conservation task (nonconservers vs. conservers) was very similar to the composition of the corresponding age groups used in the previous analyses (preoperational vs. concrete operational). Only six children classified as preoperational on the basis of age solved the conservation task. Likewise, only four children classified as concrete operational on the basis of age failed to solve this task. Thus, the fact that the previous analyses did not change substantially when identity conservation was used as the blocking variable is not surprising. However, blocking on identity conservation did not strengthen any of the relationships reported in the analyses by age. The minor differences that did appear indicated, if anything, that this blocking slightly weakened the reported effects.

Looking at the data of the ten subjects whose conservation performance conflicted with expectations based on the their age, it may be argued that this slight weakening may not really provide evidence against the conservation of identity explanation. First of all, the four concrete operational children who failed the conservation task (two 9-year-olds and two 11-year-olds) in all likelihood were conservers who failed the test for some other reason (e.g., not paying attention). Regrouping them as nonconservers probably added "noise" to the analysis, thus weakening the effect. The younger children who passed the conservation task, on the other hand, were probably true conservers. They were all five-year-olds, and it is not unheard of for children at this age to begin to conserve identity. Furthermore, although based on only six subjects, the pattern of means for degree of fear for these conserving five-year-olds was similar to that of the older, concrete operational subjects in that their fear was higher before the transformation than it was during and after it (pre-transformation: 1.00, transformation: 0.50, post-transformation: 0.67). Unfortunately, the high redundancy of age with identity conservation in these samples

prevents a clear implication of conservation as a key factor in the age distinction. One way to gain further information about such mediating factors would be to sample, in future research, from subjects in transition between the two stages.

Although our attempt to provide additional evidence linking the proposed theoretical factors to the pattern of results reported was largely not successful, the major findings of the paper should not be overshadowed. Consistent with the theorizing advanced, developmental differences in fright to The Incredible Hulk emerged strongly on the children's self-reports of fear and these differences could not be accounted for by experience alone. Future analyses on the physiological responses and facial reactions recorded during the child's viewing of the program should provide a more complete picture of the pattern of fright responses.

The basic findings of this study add strong evidence to the argument that cognitive development and emotional responses are interrelated and that the former is a significant factor in predicting and understanding the latter. These results should give encouragement to researchers employing a developmental perspective in studying children's reactions and should produce further reservations in those who lump all children together in their attempt to understand them.

From a practical standpoint, these data seem to give some insight into the reasons why preschool children are especially frightened by The Incredible Hulk and why people who are older generally fail to perceive its fear-evoking potential. This study should serve to remind parents and teachers of the importance of understanding the differences between the way children and adults perceive and comprehend the world. They must recognize this if they are to be helpful in the child's efforts to assimilate and cope with the vast array of experiences the process of growing up offers them.

Reference Notes

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Footnotes

[1]"Equivalence conservation," which is operationalized in the recognition that the quantity of water in the cylinder is the same as that in the second jar, was assessed also. But since this form of conservation seems less relevant to the understanding of mass media transformations, the results will not be discussed in this paper.

[2]This coefficient represents the percentage of coding agreements achieved by the two coders after coding the open-ended responses for 15 randomly selected subjects. Thus, out of 120 coding decisions, the coders agreed on 118 of them. All other coding reliabilities mentioned in this paper were calculated in the same way.

Table 1

Self-reports of Feelings During The Incredible Hulk

Pre-Transformation [$\chi^2_{(2)} = 28.96$, $p < .0001$]

Subject's Developmental Stage	Tone of Feeling		
	Positive	Neutral	Negative
Preoperational	23	4	10
Concrete Operational	4	25	14

Transformation [$\chi^2_{(2)} = 18.99$, $p < .0002$]

	Positive	Neutral	Negative
Preoperational	16	3	17
Concrete Operational	8	23	11

Post-Transformation [$\chi^2_{(2)} = 10.55$, $p < .005$]

	Positive	Neutral	Negative
Preoperational	17	7	16
Concrete Operational	14	22	8

Note: For all of the above tables, N = 50 for preoperational and N = 51 for concrete operational. Cell frequencies for each developmental level do not add up to these totals because subjects who were unable to describe the way they felt were excluded from the analyses.

Table 2

Self-Reports of Fear During The Incredible Hulk

Pre-Transformation [$\chi^2_{(1)} = 3.66$, $p < .06$]

Subject's Developmental Stage	Scared	Not Scared
Preoperational	17	33
Concrete Operational	28	23

Transformation [$\chi^2_{(1)} = 2.45$, n.s.]

	Scared	Not Scared
Preoperational	20	30
Concrete Operational	12	39

Post-Transformation [$\chi^2_{(1)} = 5.7$, $p < .02$]

	Scared	Not Scared
Preoperational	23	27
Concrete Operational	11	40

Note: Values indicate the number of subjects who responded "yes" or "no" to the question "Did you feel scared?"

Table 3

Ratings of David Banner and the Hulk on

Three Character Dimensions

Subject's Developmental Stage	David	The Hulk
	Good/Bad [F (1,97) = 9.94, p = .002]	
Preoperational	6.0_{b}	4.4_{a}
Concrete Operational	6.4_{b}	6.1_{b}
	Nice/Mean [F (1,97) = 7.47, p = .007]	
	David	The Hulk
Preoperational	6.2_{bc}	4.2_{a}
Concrete Operational	6.4_{c}	5.6_{b}
	Help/Hurt [F (1,97) = 17.21, p = .0001]	
	David	The Hulk
Preoperational	6.5_{b}	5.0_{a}
Concrete Operational	6.6_{b}	6.6_{b}

Note: All F values are associated with the 2 X 2 interaction. For each table, all four means are compared. Means with no subscript in common differ at $p < .05$ by the Scheffe test. N = 50 for preoperational children and N = 51 for concrete operational children. Scores ranged from 1 ("very very" bad, mean, or hurts "very very much") to 7 ("very very" good, nice, or helps "very very much.")

Table 4

Explanations of the Hulk Transformation as a Function of Age

	Don't Know	Visual Cues Only	Both Cues and Transformation	Transformation Only
Preoperational	5	19	11	15
Concrete Operational	0	8	6	37

Note: Values represent the number of subjects whose explanation fell into each of the categories. For the values in this table, $\chi^2_{(2)} = 20.2$, $p < .001$.